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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/082,227	02/26/2002	Hisae Yoshizawa	112046	2635
25944	7590	10/29/2004	EXAMINER	
OLIFF & BERRIDGE, PLC			LISH, PETER J	
P.O. BOX 19928			ART UNIT	
ALEXANDRIA, VA 22320			PAPER NUMBER	
			1754	

DATE MAILED: 10/29/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/082,227

Applicant(s)

YOSHIZAWA ET AL.

Examiner

Peter J Lish

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 August 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☒ Interview Summary (PTO-413)  
Paper No(s)/Mail Date 9/27/04
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Response to Arguments***

Applicant's arguments filed 8/05/04 have been fully considered but they are not persuasive. Applicants argue that the nanotubes of Niu et al. are not purified and thus would not have the properties associated with the nanotubes of Ebbesen. However, the process of forming oxidized nanotubes, as taught by Niu et al. is seen to purify the nanotubes. Furthermore both Niu et al. and Ebbesen teach the acid oxidation of nanotubes and are thereby expected to yield nanotubes having equivalent properties.

### ***Claim Rejections - 35 USC § 102/103***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 26 is rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ebbesen (*Carbon Nanotubes: Preparation and Properties*), with Niu et al. (US 2003/0039604 A1) to show a state of fact.

Ebbesen teaches a liquid phase purification for carbon nanotubes which comprises removing the nanotube material from the deposit, grinding the material with a mortar and pestle, dispersing in sulfuric acid, and raising the heat of the dispersion to about 150 °C. Ebbesen teaches that this purification process leads to the nanotube surface being oxidized while the inner layers of the multishell nanotubes are not affected.

It is not explicitly taught that the process results in modified graphene sheets, such as those containing amorphous carbon, however, it is expected that this be the case, as no difference is seen between the process of Ebbesen and that of the instantly claimed invention. Where, as here, the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which anticipate or render obvious the claimed invention, the burden of proof is shifted to the applicant, as in *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980).

Ebbesen does not explicitly teach the formation of a nanonetwork through adhering the oxidized multi-walled nanotubes to each other, although it appears from figure 4.13 that this occurs. Niu et al., however, teach that carbon nanotubes become self-adhering after oxidation. Very hard, dense mats are formed by highly dispersing the oxidized nanotubes, filtering, and drying (paragraph 0117). Because Ebbesen teaches the oxidation, filtering, and drying of the nanotubes, it is expected that the nanotubes adhere to one another, as taught by Niu et al.

While Ebbesen does not explicitly teach applying the dispersion to a substrate to form a film containing the nanonetwork, it is seen that the process of filtering the nanotubes results in the formation of a film containing the nanonetwork on the filter material, which acts as a substrate.

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Niu et al. (US 2003/0039604 A1) taken with Ebbesen (*Carbon Nanotubes: Preparation and Properties*).

Niu et al. teaches a process for the formation of nanonetworks comprising oxidized and cross-linked multi-walled carbon nanotubes. The process comprises forming oxidized nanotubes, highly dispersing the oxidized nanotubes, filtering, and drying. Niu et al. teach that a cross-linking agent may be used, but is not required because carbon nanotubes become self-adhering when oxidized. Niu et al. do not explicitly teach a method of modifying multi-walled nanotubes by performing a mechanochemical treatment and subsequently performing a heating treatment in an acid solvent.

Ebbesen teaches a liquid phase purification for carbon nanotubes which results in the formation of oxidized multi-walled nanotubes, comprising removing the nanotube material from the deposit, grinding the material with a mortar and pestle, dispersing in sulfuric acid, and raising the heat of the dispersion to about 150 °C. Ebbesen teaches that this purification process leads to the nanotube surface being oxidized while the inner layers of the multishell nanotubes are not affected.

It is not explicitly taught that the process results in modified graphene sheets, such as those containing amorphous carbon, however, it is expected that this be the case, as no difference is seen between the process of Ebbesen and that of the instantly claimed invention. Where, as here, the reference discloses all the limitations of a claim except a property or function, and the examiner cannot determine whether or not the reference inherently possesses properties which

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anticipate or render obvious the claimed invention, the burden of proof is shifted to the applicant, as in *In re Fitzgerald*, 619 F.2d 67, 205 USPQ 594 (CCPA 1980).

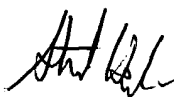
It would have been obvious to one of ordinary skill at the time of invention to use the nanotubes treated by the process of Ebbesen in the formation of a nanonetwork, as taught by Niu et al., because the nanotubes of Ebbesen meet the requirements of Niu et al. in that they are oxidized multi-walled nanotubes.

While Niu et al. does not explicitly teach applying the dispersion to a substrate to form a film containing the nanonetwork, it is seen that the process of filtering the nanotubes results in the formation of a film containing the nanonetwork on the filter material, which acts as a substrate. Alternatively, it would have been obvious to one of ordinary skill at the time of invention to apply the nanonetwork to a substrate, in order to facilitate its storage or use in a variety of applications.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Lish whose telephone number is 571-272-1354. The examiner can normally be reached on 9:00-6:00 Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stanley Silverman can be reached on 571-272-1358. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.



PL

STUART L. HENDRICKSON  
PRIMARY EXAMINER